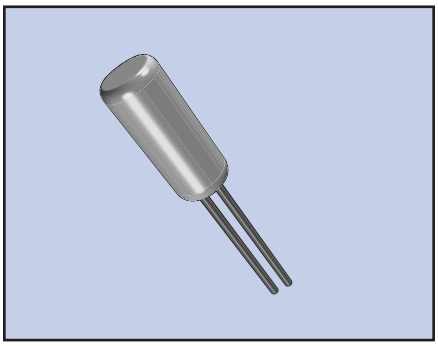
# ECS-3X8, 2X6, 1X5 32.768 KHz TUNING FORK CRYSTALS



ECS tuning fork type crystals are used as a clock source in communication equipment, measuring instruments, microprocessors and other time management applications. Their low power consumption makes these crystals ideal for portable equipment.

## FEATURES

- **Cost effective**
- **Tight tolerance**
- **Long term stability**
- **Excellent resistance and environmental characteristics**

## PART NUMBERING GUIDE *"EXAMPLE"*

| | | FREQUENCY | | LOAD CAPACITANCE | | PACKAGE TYPE* |
|---|---|---|---|---|---|---|
| ECS | – | .327 | – | 12.5 | – | 8 |
| ECS | – | .327 | – | 12.5 | – | 13 |
| ECS | – | .327 | – | 8 | – | 14 |

** Package type examples (8=3x8, 13=2x6, 14=1x5)*

## OPERATING CONDITIONS/ELECTRICAL CHARACTERISTICS

| PARAMETERS | | ECS-3X8 | ECS-2X6 | ECS-1X5 | UNITS |
|---|---|---|---|---|---|
| NOMINAL FREQUENCY | Fo | 32.768 | 32.768 | 32.768 | KHz |
| FREQUENCY TOLERANCE | Δf/fo | ±20 | ±20 | ±20 | PPM |
| LOAD CAPACITANCE (typ.) | $C_L$ | 12.5 | 12.5 | 8.0 | pF |
| DRIVE LEVEL (max.) | $D_L$ | 1 | 1 | 1 | µW |
| RESISTANCE AT SERIES RESONANCE | $R_1$ | 35 (max.) | 35 (max.) | 40 (max.) | KΩ |
| Q-FACTOR | Q | 90,000 (typ.) | 70,000 (typ.) | 80,000 (typ.) | |
| TURNOVER TEMPERATURE | $T_M$ | +25 ±5 | +25 ±5 | +25 ±5 | ˚C |
| TEMPERATURE COEFFICIENT | ß | -0.040ppm/˚C² max. | -0.040ppm/˚C² max. | -0.040ppm/˚C² max. | PPM/(Δ˚C) |
| SHUNT CAPACITANCE | $C_0$ | 1.60 (typ.) | 1.35 (typ.) | 1.00 (typ.) | pF |
| CAPACITANCE RATIO | | 460 (typ.) | 450 (typ.) | 400 (typ.) | |
| OPERATING TEMP. RANGE | $T_{OPR}$ | -10~+60 | | | ˚C |
| STORAGE TEMP. RANGE | $T_{STG}$ | -40~+85 | | | ˚C |
| SHOCK RESISTANCE | | Drop test 3 times on hard wooden board from height of 75cm / ±5 PPM max. | | | PPM |
| INSULATION RESISTANCE | IR | 500MΩ min./DC100V | | | MΩ |
| AGING (FIRST YEAR) | Δf/fo | ±3 PPM max. @ +25˚C ±3˚C | | | PPM |
| MOTIONAL CAPACITANCE | $C_1$ | 0.0035 (typ.) | 0.0030 (typ.) | 0.0025 (typ.) | pF |

*Note: Contact factory for optional load capacitance.*

## PACKAGE DIMENSIONS (mm)

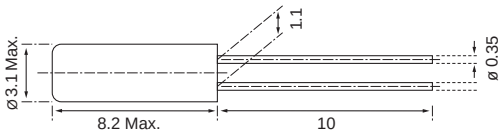



*Figure 1) ECS-3X8*

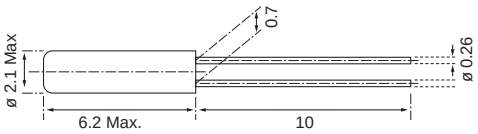



*Figure 2) ECS-2X6*

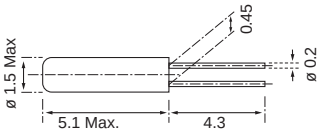
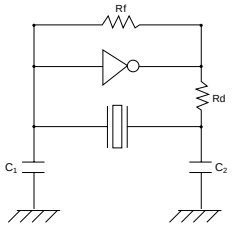



*Figure 3) ECS-1X5*

### RECOMMENDED OSCILLATION CIRCUIT

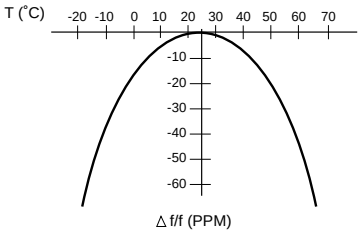



**ELECTRICAL CHARACTERISTICS**

IC: TC 4069P
Rf: 10MΩ
Rd: 330KΩ (As required)
$C_1$ = 22pF, $C_2$ = 22pF
$V_{DD}$ = 3.0V

*In this circuit, low drive level with a maximum of 1µW is recommended. If excessive drive is applied, irregular oscillation or quartz element fractures may occur.*

### PARABOLIC TEMPERATURE CURVE




*To determine frequency stability, use parabolic curvature. For example: What is the stability at 45˚C?*

*1) Change in T (˚C) = 45 -25 = 20˚C*
*2) Change in frequency = -0.04 PPM x $(\Delta T)^2$*
*= -0.04 PPM x $(20)^2$*
*= -16.0 PPM*

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